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ABSTRACT

Adjustment problems of teachers in rural Alaskan schools stem from excesses in the physical elements and from the emotional and intellectual drain of encountering virtual isolation and cultural unfamiliarity. As a result, teacher turnover is a major obstacle to providing quality educational opportunity in rural schools. This research study attempted to determine (1) if some personal characteristics are predictive of attrition of teaching couples, (2) if quality differences exist in relation to a teacher's length of service in rural Alaskan schools, and (3) if participation in the Alaska Rural School Project (ARSP) summer institute is associated with curtailed rates of teacher attrition. Instruments used in the study were the Miller Analogies Test, the Minnesota Teacher Attitude Inventory, and an ARSP-developed Biographical Information Inventory. Among the findings, it was noted that (1) teachers with few college credits are more prone to attrition than those with many college credits, (2) attrition-proneness is greatest in teachers hired with little or no formal training in education, (3) teachers staying for 2 years are estimated to be of the highest quality, (4) no consistent quality differences are found between teachers leaving after 1 year and those staying 3 years or longer, and (5) preservice training such as is encountered in the ARSP can likely reduce premature attrition by as much as 13%. (JH)

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TEACHER SURVIVAL IN AN EXTREME ENVIRONMENT

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ALASKA
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PROJECT

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CHAPTER I

INTRODUCTION

The scope of this report will be limited to one aspect of a teacher's performance in Alaska's rural schools; the span of his service to the educational needs of a populace emerging from its once isolated condition. The adjustment problems encountered by a non-Alaskan to the physical elements of life in the bush are by no means small. Unaccustomed excesses of weather in nearly all geographical areas of Alaska, from the bitter cold of the interior and the monotonous chill of wind in the west to the near ceaseless overcast of rain in the southeast, tax the resources of normally patient people. Long dark nights help little. But even these problems are small compared with those stemming from the drain on the emotional and intellectual reserves of a teacher facing perhaps his initial encounter with virtual isolation, confined in an interpersonal maze of cultural unfamiliarity. It is little wonder that teacher attrition is a major obstacle to providing the quality of rural educational opportunity long recognized as a minimum condition for non-marginal participation in an enveloping society of great complexity.

Extensive attrition exacts its toll in many ways. The cost financially, while notable, may be the least important of these in light of the ways in which high rates of turnover operate to defeat the very objectives the state educational system wishes to attain. For example, a history of high attrition in a given village may *a priori* communicate a strong implication of rejection to its inhabitants. There is a discrepancy between this message and official policies intended to support and enhance the basic worth and dignity of Alaska's indigenous people. Another concomitant of high teacher attrition is to thwart the formation of pupils' trust in the stability of the education system, trust important to the development of motivation to succeed within that system.

There is yet another adverse result of high teacher turnover which has its effect on the total system. Because of the relatively extreme teaching conditions, some of which were alluded to above, the pool of quality applicants becomes limited. High attrition further taxes the limited selection pool by making oversized demands on its fund of qualified teachers. If turnover were low, the availability of superior teachers would be relatively adequate. The effectiveness of teaching in rural Alaska is reduced to the extent that high attrition rates force recruitment deeper into the selection pool; perhaps below optimum depths for the survival of quality education.

A few general figures may help the reader establish a perspective on the magnitude of the attrition problem in rural Alaska. Overstreet (1960), presents data on teacher turnover in State Operated Schools (rural) for each school year from 1952-53 through 1959-60. During that inclusive period there was an average annual loss of 51.1 percent. The only encouragement in the figures obtained by Overstreet is that there is a marked trend for the annual percent loss to decline over the years. This is consistent with the fact that estimates of attrition for the last two or three years range from 30 to 35 percent.

However, the decline in percent annual loss to the system does not reflect expansion of the system's size (number of teaching positions). There has been a three-fold increase in this figure since the 1952-53 school year. Whether the expansion of the selection pool has kept pace with this increase is crucial to the issue raised earlier as to the relationship between attrition rates and the quality of available applicants. There are no data at present regarding the size and present quality of the selection pool for Alaska's rural schools. The pool has most likely expanded, but it is not known, beyond subjective speculation, the extent to which its rate of increase

matches or exceeds the demands placed on it by turnover in Alaska's remote schools. The major point to be made is that a simple reduction in percent loss per year is not a completely adequate index of the success of the system in curbing the possible drain on the quality of education in the state's rural communities. But a major goal remains for the school system to take steps and reduce the number of teacher losses it sustains each year. It is hoped this report will increase the scope of knowledge necessary for the realization of this aim.

Criterion development

As utilized here, attrition is one of many potential criteria for evaluating the performance of teachers in the bush. Attrition, however, has the initial advantage of being a highly observable method of classification. It is, in the sense of the opening paragraphs of this report, a direct (but by no means exhaustive) measure of a teacher's usefulness to the people he was employed to serve. When he leaves, he is essentially lost to the system no matter what the quality was of his classroom teaching experience.

For purposes of data analysis, teacher attrition has been conceptualized in two different ways, each appropriate to a particular set of statistical operations. First there is a global *In-Out* (I-O) criterion. With this criterion, a dichotomous distinction is made between teachers who are presently teaching in an Alaskan rural school and teachers who are no longer, i.e., who have left the system. The second criterion concept is called the *Length of Service* (LOS) criterion. Here a teacher is classed according to the number of years of service he has given to teaching in rural schools in Alaska subsequent to some specified starting point. Subclassifications within the *Length of Service* criterion may also be used, such as a two-part classification into (a) those who taught one year or less, and (b) those who taught two years or more.

The information for this criterion was supplied through the cooperation of the U.S. Bureau of Indian Affairs and the Division of State Operated Schools of the Alaska Department of Education. Only those data considered to be in the public domain were used in the development of personal criterion records for this study.

The Alaska Rural School Project

The Alaska Rural School Project (ARSP) was established through a grant from the Ford Foundation in 1965. It continues as an integral part of the College of Behavioral Sciences and Education of the University of Alaska. The basic purposes of the ARSP are summarized in a statement from a Project recruiting brochure:

> To provide an intensive eight-week summer institute for training teachers newly assigned to village teaching by the State Department of Education, the Bureau of Indian Affairs and independent school districts with small schools. Training concentrates on formal coursework in cultural anthropology of Alaskan natives, the teaching of English as a second language and special methods, materials and techniques appropriate to small schools and the Alaskan environment. In addition to the formal coursework, a number of selected topics and experiences designed to acquaint the new teacher with rural Alaska and unique problems of teaching in small isolated schools are provided.

Through 1969, the ARSP has served 189 participants. Of these, 92 represented the BIA, 89 represented the State Department of Education, and 8 were from smaller

school districts. Put another way, about 28 percent of all new BIA teachers, 21 percent of all new State Department teachers and some unknown but probably small percent of all new district teachers, participated in one of the Alaska Rural School Project's summer institutes.

One valuable contribution of the Alaska Rural School Project has been to provide a broad base of data from which to carry out intensive statistical analyses. Beginning in the 1966 ARSP summer institute, project participants each year have taken a variety of personality, attitude, and achievement tests, selected to cover a wide range of personal capabilities and characteristics. The analysis of the data has been held back until now principally to await the establishment of suitable criteria against which to evaluate their predictive effectiveness.

These data cannot be accepted without some caution regarding the generality of findings for the rest of the state's rural teachers. Project participants do not comprise a random sample of all teachers new to Alaska's rural school systems. They select themselves generally by (a) showing interest enough to apply, and (b) having the summer free to attend ARSP prior to service. All applicants must possess teaching contracts with the State Operated Schools, the Bureau of Indian Affairs, or a local rural school district. While the selection of the sample of teachers is not random, it is not necessarily unrepresentative. With the above selection factors in mind as a necessary call to caution, the results gained through the analyses to follow constitute the most exhaustive evaluation to date of the nature of teacher attrition throughout rural Alaska.

As a final note, the data used in the statistical analyses presently reported generally are confined to teachers in State Operated Schools. Exceptions are noted as appropriate.

INTRODUCTION TO THE RESEARCH

Rather than attempt an exhaustive descriptive summary of all the data collected on ARSP participants, an approach will be taken in which the data are organized around three major research questions. Two considerations entered into the selection of these questions:

1. the availability of data, directly relevant to the question, which would be amenable to definitive statistical analysis, and
2. the question's relevance to the development of a general theory of attrition for rural Alaska. This theory will be posed in a later section of the present report.

Research Questions

I. Are there personal characteristics predictive of attrition of teaching couples? Most of the ARSP participants are members of husband-wife teaching teams. Not only do they comprise the bulk of the data, but more importantly, each couple is best conceptualized as a decision-making unit whenever the question of attrition is raised. Treating background data as if each person were an autonomous individual making his own decision to stay or leave would often be misleading as will be seen in the next section.

II. Are there quality differences which relate to a teacher's length of service in Alaska's rural schools? The concept of teacher quality tends to raise controversy among education practitioners at every level. The position of the present author is that teacher quality is a multifaceted concept rather than a unitary attribute. Positive and negative components are not necessarily the opposite extremes of a single dimension. The importance of this conceptualization of teacher quality will be demonstrated in

the section on research as well as in the development of the general theory of attrition following.

III. Is participation in the Alaska Rural School Project summer institute associated with curtailed rates of attrition for rural teachers in Alaska? As noted earlier, ARSP participants are not randomly assigned to the project. This makes it difficult to draw conclusions as to what causal relations there are between ARSP participation and attrition. Reasonable explanatory alternatives may be suggested, however, each of which has its own significance for the attrition problem discussed in the introduction to this paper.

CHAPTER 2

RESEARCH FINDINGS
PERSONAL CHARACTERISTICS AND THE ATTRITION OF COUPLES

Some of the initial findings regarding this question were reported at the 20th Alaska Science Conference (Orvik, 1969). Since then, further analyses have been made allowing the issue to be more fully articulated.

The principal goal of the analysis is to determine the kinds of personal characteristics associated with whether a couple decides to continue or leave teaching in the bush. To do this it is important to outline various *patterns* of characteristics occurring within couples, some of which go beyond a separate description of the individual member. These patterns may be classified globally as:

I. **Complementary.** This refers to specific ways in which members of a couple are different from one another. Complementarity is said to exist only when such differences are identified as being related to attrition. The latter requirement is made so that complementarity arising from just any observed intracouple differences can be distinguished from those forms of complementarity that are criterion-related.

II. **Homogeneous.** This refers to dimensions upon which the members of a couple exhibit similar characteristics. Again, for discursive purposes, only criterion-related homogeniety is identified in the present report.

Categories I and II will be generically referred to as intracouple characteristics.

III. **Specific.** This category refers to characteristics which are individually descriptive of either one or both members of a couple. That is, when a characteristic is related to attrition simply by virtue of persons having more of it or less of it, it is said to be specific. This kind of pattern is distinguished from patterns of *complementarity* and *homogeniety* in that it would not appear to depend on the interaction between the members of a couple for its conceptualization.

In this set of analyses, the In-out criterion will be utilized. A couple's accountability to this criterion began in the school year immediately following participation in either the 1966, 1967, or 1968 Alaska Rural School Project summer institute. Each subsequent school year was treated as an attrition risk-period. The couple was classed as having attrited or not at the end of each risk period to which he was accountable. In this way, couples who participated in ARSP in different years could be put on the same base line for the In-out criterion by identifying those who did and did not attrite following any applicable risk period. Since criterion data is not yet available for participants in the 1969 ARSP summer institute, they are not included in any of the analyses reported in this paper.

Intracouple Characteristics

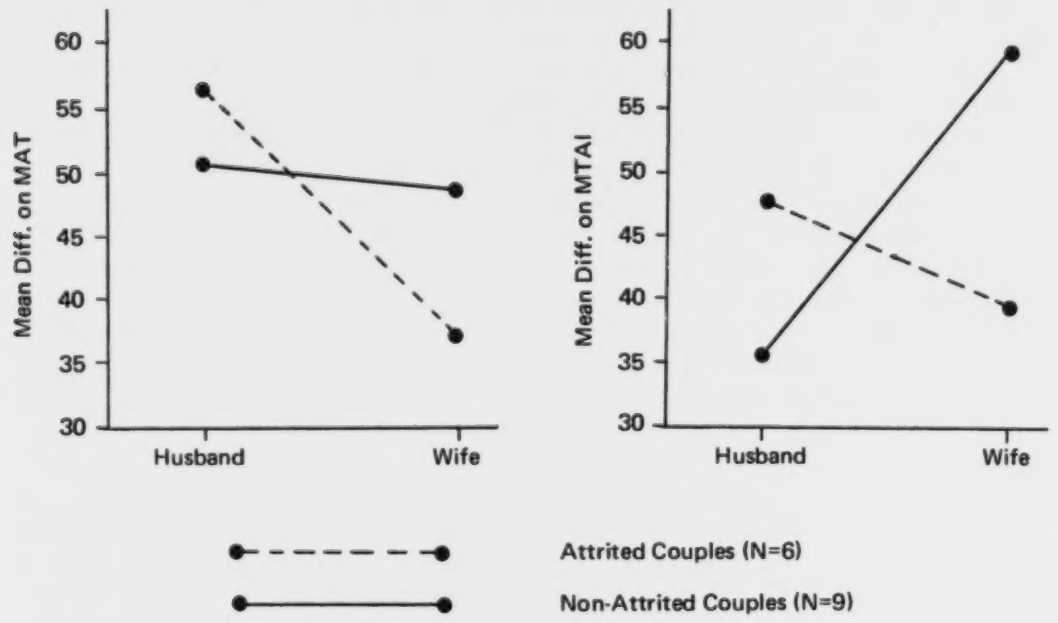
There are two instruments whose scores show some evidence either of complementary or homogeneous patterning relevant to attrition. These are the *Miller Analogies Test* (MAT) and the *Minnesota Teacher Attitude Inventory* (MTAI).[1] Complementary patterns conducive to high rates of attrition exist for couples in which the husband scores a good bit higher than his wife on the MAT. Couples that stay with rural school teaching show a tendency to be homogeneous in their MAT scores. Figure 1, shows this condition graphically. If persons were treated singly, the MAT scores for attrited and non-attrited individuals would not differ significantly. When the wife's

[1] For descriptions of these and other tests mentioned in this report, see Appendix A.

score is subtracted from the husband's, however, the intracouple pattern becomes clear.

Figure 1

Mean MAT and MTAI Scores of Attrited and Non-Attrited Couples



Supporting the results on the MAT are intracouple patterns on the MTAI where two kinds of complementarity come into focus. One is complementarity associated with attrition and the other is complementarity associated with longevity. In the latter case, couples where the wife's MTAI score is considerably higher than her husband's tend not to attrite while the opposite complementary relationship seems to hold for attrition-prone couples. Again, the important finding is not so much in the absolute scores of individuals but in the relationship between scores of husband and wife.

Specific Characteristics

The data reported above reflect attitudes toward teaching and pupils (MTAI) and achievement in the development of verbal skills (MAT). We turn now to data concerning various background characteristics. These characteristics do not seem to rely on intracouple relationships as much as do those reported earlier. They seem instead to relate to the probability of attrition in a much more direct fashion.

The first of these *specific* variables deals with the education background of the individual. Figure 2, shows attrited and non-attrited couples on three education-background variables. Couples who have remained in the bush tend to have completed more credit hours in their college or university experience than have attrited couples. This applies both to husbands and wives. Even more striking is the fact that husbands in attrited couples have taken *no* courses in elementary education and have fewer hours in education *per se* than have husbands in couples that remain. It is interesting to note that none of these three variables, if taken alone, reliably distinguishes between attrited and non-attrited couples. As a composite, however, they

Figure 2

Mean Scores for Couples on Three Education Variables

represent a strong relationship between the husband's education background and attrition. Wives, on the other hand, show little or no tendency for their background in education courses to be related to attrition.

Another important source of data has been the *Biographical Information Inventory* developed by the ARSP staff and given in each summer institute since the project's inception. For this analysis the inventory items were regrouped into empirical clusters by the method of factor analysis. Participants were then rescored to produce a single score on each cluster (see Appendix A) in an attempt to reduce the number of variables in the data analysis. Scores on two of these clusters are strongly related to attrition.

The first cluster comprises items related to the size of the school and town in which the individual had his elementary and secondary education; or more broadly whether the early years were spent in a rural or an urban environment. The present data clearly suggest that persons (couples) from a relatively urban environment, are *less* prone to attrition than are persons from a more rural background.

The second of these clusters may be interpreted tentatively as measuring some aspect of intrinsic or internalized interest in the teaching profession. Teaching couples who are prone to remain in the bush have scores which indicate relatively higher interest in the teaching profession. This finding is particularly consistent with those concerning educational backgrounds and will assume importance in the theoretical section of this report.

Discussion

There are three general points for discussion that should immediately strike the reader.

1. Patterns of *complementarity* associated with high rates of attrition seem consistently to show the wife scoring well below her husband. This appeared both on

the MAT and the MTAI and is supported by trends on other achievement tests not reported here.

2. *Specific* variables associated with attrition, in most cases, key on the centrality of the education profession to the life of the teacher. A principal trend is for those who are not primarily education-centered to have a higher probability of attrition.

3. The favorability of a relatively urban up-bringing to longevity of teaching in the bush is worth noting. Great controversy exists among practitioners of rural education in and out of Alaska regarding this issue. Arguments from both sides are not at all difficult to elicit. Here are empirical data to help the battle rage.

TEACHER QUALITY AND LENGTH OF SERVICE

Participants in the 1966 ARSP summer institute now have a possibility of three full years of service behind them. We now know that some left at the end of their very first year, some at the end of their second year, and some have given three or more years of service since 1966. This analysis deals with whether there are differences in the quality of these teachers related to how long they stayed in the bush. This question has a great bearing on the overall quality of teaching, over time, in Alaska's remote regions. How confident can we be that the highest quality teachers are remaining for a profitable length of service?

Sociometric nominations (peer ratings) were used as multidimensional estimates of teacher quality. The validity and reliability of this technique in a very wide variety of settings has been established to the point where peer ratings can be utilized as effective performance criteria in themselves (Nelson and Gunderson, 1963; Moreno, 1965).

Method

At the end of the fifth week of the 1966 Summer Institute, peer ratings were obtained on a variety of attributes, ranging from estimates of intelligence to the prediction of problems in village relations. Eight of the attributes were of greatest relevance to the present study. Five of these attributes are positive, and relevant to teaching ability and/or the general ability to succeed in adjusting to remote village life Two items relate to negative attributes which would detract from adjustment capabilities. One item relating to sociability was analyzed in order to test against the possibility that this sort of attribute was a common basis for sociometric choice, thus contaminating the other items. In this regard, it is preferable from a validity standpoint for attributes to be unrelated empirically to the extent that we would expect them to be unrelated logically.

Sociometric Choice Items

A. Positive – ability related
   1. "Five participants whom (sic) you consider to be the most intelligent participants."
   2. "Five participants for whom you predict success in teaching in Alaska rural schools."
   3. "If you were a principal and you had a choice of five teachers from the Institute, indicate your preference in order."
   4. "Five participants whom (sic) you would choose academically."

B. Negative – problem related
   1. "Five participants for whom you anticipate teaching problems in Alaska rural schools."
   2. "Five participants for whom you anticipate problems in village relations."

C. Neutral – social related
   1. "Five participants whom (sic) you would choose socially."

Choices were made from a numerical roster coded to identify the participants from a group photograph.

Each participant was scored on each item according to the total number of nominations he received from his peers. These scores were compared with the *length of service* (LOS) criterion so that teachers who taught for one, two, or three years could be differentiated according to the qualities measured in peer ratings.

Results

Figure 3, page 10, portrays graphically the average number of nominations received by the members of each criterion group on each of the eight peer ratings. Ratings one through five – the positive criterion-relevant attributes – show a clear indication that teachers who remain for two years (N=12) give evidence of the greatest quality. Just as notable is the tendency toward little difference between teachers that leave after the end of the first year (N=18) and teachers that stay three years or longer (N=13). On the negative items – anticipated problems in teaching and/or village relations – teachers with the greatest number of nominations show a strong tendency to attrite after a very short length of service. Teachers with the greatest longevity, while not scoring remarkably high on positive attributes, were predicted to have few problems in their rural teaching careers. As anticipated, the *sociability* item showed no significant tendency to be associated with a teacher's length of service.

Discussion

Recruitment will never be error-free. The above analyses suggest whatever the process underlying attrition, it operates in such a way as to reduce the number of persons with overtly negative attributes. It does not necessarily operate to hold on to persons possessing high quality on positive attributes. More will be said of this trend in the theoretical section of this paper.

THE ALASKA RURAL SCHOOL PROJECT AND ATTRITION

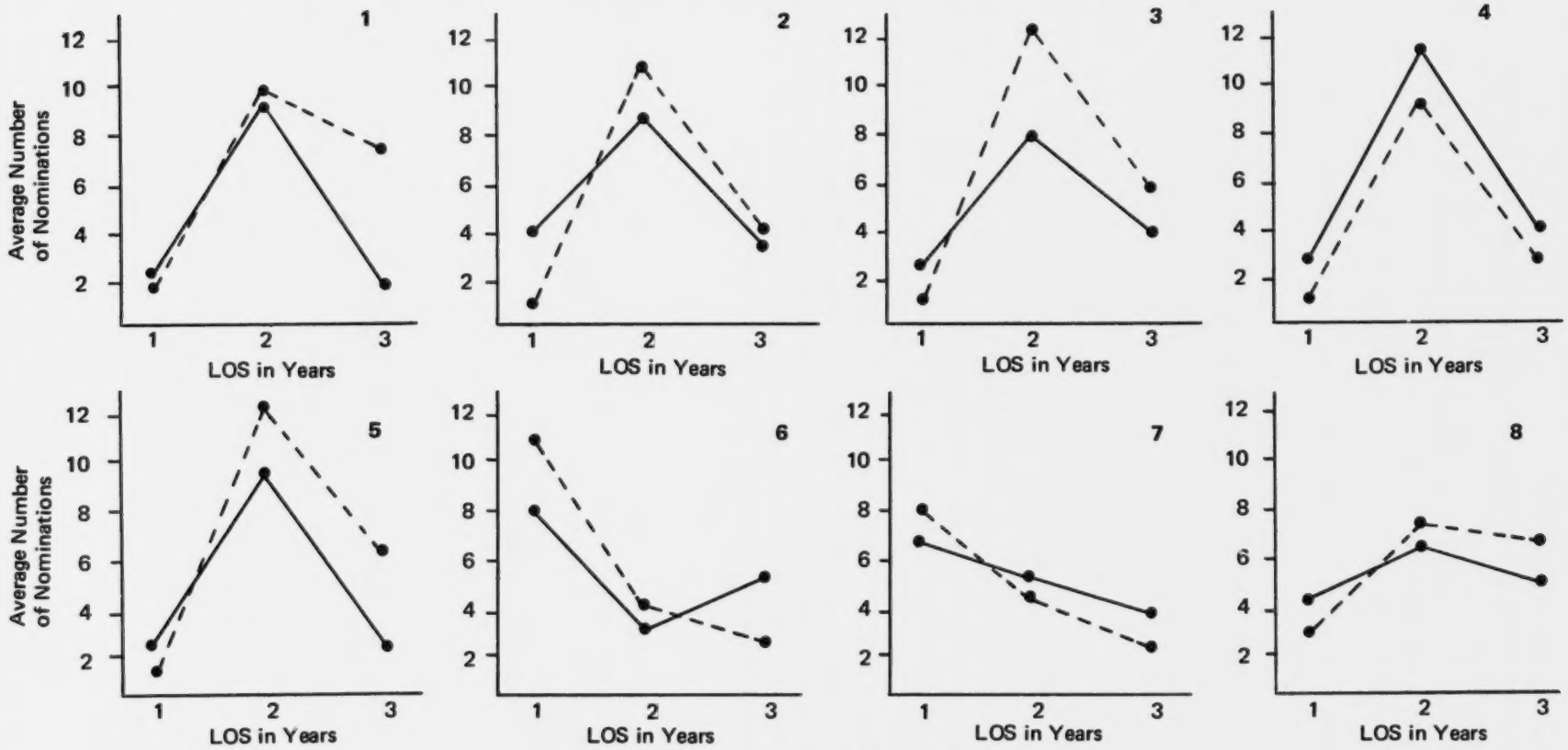
As pointed out in the introduction, there has been a general reduction in teacher attrition rates over the last twenty years. The question posed in this section concerns the extent to which the Alaska Rural School Project, through its program of teacher preparation, has the potential for reducing further the annual teacher loss. The first step in answering such a question is to assess empirically whether the ARSP program is even statistically associated with lower attrition rates. Attempts to explain just how the ARSP does this must await a demonstration that it indeed accomplishes that end.

Method

Because of the changing attrition rates over the years, attrition rates for ARSP participants must be compared only with rates for teachers new to the system in the

Figure 3

Sociometric Results for 1966 ARSP Summer Institute by Length of Service and Agency of Affiliation



ITEMS:
(1) Name the five most intelligent.
(2) Name the five for whom you predict success in teaching in Alaska's rural schools.
(3) If you were a principal name the five you would choose as teachers.
(4) Name the five from whom you would seek advice in teaching.
(5) Name the five you would choose academically.
(6) Name the five for whom you anticipate teaching problems in Alaska rural schools.
(7) Name the five for whom you anticipate problems in village relations.
(8) Name the five whom you would choose socially.

same years, i.e., 1966-67 through 1968-69. Lists of new teachers in these years were drawn up by personnel at the Division of State Operated Schools. These lists were based on the teachers attending the new-teacher orientation held each year by the state. Such lists are reasonably accurate for the purposes of the present research. Participants in the ARSP summer institute were identified in each list. The next step was to examine the Alaska State Education Directory each year subsequent to a new teacher's initial year to determine his length of service in the state's rural schools.

The only meaningful way in which ARSP and non-ARSP teachers from all three years can be compared is to dichotomize the *Length of Service* criterion. Thus, teachers who stayed only one year or less comprise one category and those who stayed two years or longer comprise the other. The objective then, is to compare the relative proportions of ARSP and non-ARSP teachers comprising each attrition category.

Results

Table 1, shows the frequencies and percentages of teachers, who did and did not attend an ARSP Summer Institute, within each of the two criterion categories. As can be seen, the trend in these figures is favorable to the hypothesis that ARSP participation is associated with lower attrition rates. The system lost 31 percent of its ARSP participants after their first year compared with 44 percent of those who did not attend ARSP.

TABLE 1

Relative Incidence of Premature Attrition for Participants in ARSP and Nonparticipants

	Length of Service					
	One Year or Less		Two Years or More		Total	
	Number	Percent	Number	Percent	Number	Percent
Participated In ARSP	18	31.0	40	69.0	58	100.0
Did not Participate	93	44.3	117	55.7	210	100.0
Total	111	41.4	157	58.6	268	100.0

Discussion

To discuss adequately the foregoing analysis it is necessary to introduce the concept of *premature* attrition. This concept implies a length of service subjectively considered by administrators to be of adequate length to justify the investment of recruiting effort. Attrition prior to this minimum length of service is classified as premature. Officials of the State Operated Schools system and the Bureau of Indian Affairs in Alaska tend to regard attrition occurring prior to two years of service as premature. The results presented in Table 1, are therefore relevant to a form of the original research question, i.e., is ARSP participation associated with reduction of *premature* attrition? The answer is affirmative. The form of teacher preparation

embodied in the Alaska Rural School Project appears to curtail attrition where it is the most costly to the system; subsequent to the teacher's first, critical year.

There are a number of reasonable theories as to how the ARSP program reduces attrition. Three of them are reviewed here.

1. The project carries out its objective to prepare teachers for the rigorous life in the bush, not the least of which is the demand upon patience, sensitivity and understanding stemming from isolation in a new culture. In this sense, preparation leads to increased adjustment potential.

2. The project serves to attract a certain kind of person; prone to longevity but not ordinarily interested in making the transition from an urban to a remote setting without adequate preparation. The prospect of such preparation supplies the needed impetus to "take the plunge," after which intrinsic motivation takes over to add longevity to this person's stay.

3. The project may serve mainly to reduce a teacher's mid-winter feeling of isolation and aloneness by acquainting him, during the summer, with a cadre of teachers facing exactly the same prospect. The consequent "we feeling" may also produce a sense of duty to not fail; to stick with it. In this regard it is known that many of the friendships formed during the summer institute carry through the school year in the form of personal communication on a professional as well as social level.

These theories were not meant to be exhaustive or mutually exclusive. However, they all should be considered as viable factors in the success of the Alaska Rural School Project in helping to stabilize the adverse effect of teacher attrition on the quality of rural education in Alaska.

CHAPTER 3

TOWARD A GENERAL THEORY OF TEACHER ATTRITION

In this section a general theory of teacher attrition is presented which has as its basis three major factors – (1) the teacher's adjustment potential, (2) the availability of acceptable alternatives, and (3) the cost of leaving. Each factor is discussed as (a) a general concept free of specific content, and (b) a practical concept to guide the interpretation of specific findings reported in the previous section. A following discussion will attempt to analyze some possible relationships among the factors affecting the overall quality of teaching in Alaska's remote areas.

Adjustment potential

Adjustment, in the present discussion, refers to the achievement of an on-going state in which the psychological costs of remaining in a remote setting no longer exceed the perceived rewards – past, present and future, of maintaining the relationship.

Postulate I. The ability to adjust is a necessary condition for longevity.

How one adjusts or what characteristics predict adjustment potential are not dealt with in this postulate. Only the logical, *a priori,* relationship between adjustment and longevity is stated. The empirical issues are approached through the following summary statements reflecting some of the findings reported earlier:

1. **Intracouple characteristics** – It almost goes without saying that lack of compatability leads to reduced adjustment potential. There seem to be, however, certain important dimensions relevant to the survival of teaching couples in the bush. Expertise is an example of one such dimension. If a wife were to assume leadership in repairing and maintaining the village generator, it might well introduce role confusion into the couple's efforts to adjust. On the other hand, it seems conducive to adjustment for a wive to be able to show expertise in matters regarding teaching and the classroom. This pattern is strongly suggested in the findings for the MTAI discussed earlier.

2. **Background in the Education Profession** – As stated earlier, a common pattern underlying *premature* attrition was for the husband to have come from outside the field of education, particularly elementary education. This was supported by a biographical factor showing a relative absence of internalized interest in the field of education. This dimension is related to attrition, perhaps because it adds an additional adjustment hurdle to overcome for those not initially trained in education. For persons whose background is primarily in education, who manifest intrinsic interest in the field, this aspect of their assignment is an asset rather than a liability to adjustment potential.

3. **Village differences** – No empirical data has been gathered to differentiate villages on the basis of the demands they impose on a teacher's adjustment potential. Wide variance in such things as the amount of mid-winter daylight, the degree of isolation from outside contact, or the extent to which pupils are proficient in the English language, is characteristic of Alaska's rural areas. Future research will attempt to isolate village description factors associated with teacher adjustment potential as it relates to attrition.

Availability of Alternatives

If, for the moment, this factor can be treated separate from its natural interaction with the adjustment potential factor, a number of reasonable concepts come to mind.

Postulate II. The probability of attrition is positively related to the number and quality of alternatives available to the individual.

Corollary i. In couples, the probability of attrition is more strongly related to the number and quality of the husband's available alternatives than to the wife's.

Postulate III. The number and quality of available alternatives is directly related to the personal competence of the individual.

It follows, then, that the personal competence of the husband is weighed more heavily than that of the wife in predicting attrition for couples. The personal competence of the wife would seem to be more important to the *adjustment potential* of the couple. That is, the husband's competence tends to determine the availability of alternatives, the wife's level of competence is critical to the adjustment potential of the couple.

Some findings relevant to the availability of alternatives are discussed here.

1. **Further education** – It was pointed out previously that attrited persons show a strong tendency to have fewer hours of college credit than do persons who survive. The alternative of further education would be somewhat, though not entirely, coextensive with the number of credit hours already completed.

2. **Academic aptitude** – One measure of personal competence in the original test battery is the *Miller Analogies Test*. The tendency for attrited couples with the husband having high MAT scores supports the *further education* alternative insofar as it makes it a reasonably attainable choice.

3. **Global competence** – The kind of competence measured in the MAT can easily be assumed to have global marketability in many spheres, other than academic. The MAT, for example, shows a substantial correlation with success in higher echelons of corporate management.

Costs of Leaving

Relocation costs. These costs are always a factor in the assessment of personnel mobility. In Alaska such costs would naturally assume even larger proportions since the distances, especially to the "lower 48," are substantial. The decision to leave Alaska must, of course, take into consideration one's financial ability to incur relocation costs. The ability of teachers to absorb the costs of relocation changes over time so that the cost is generally greatest in the first year. However, because the capacity for teachers in the bush, particularly couples, to save money is generally greater than for those in non-isolated, relatively urban settings, this form of leaving-cost is probably negligible.

Investment in the system. Charters (1970), analyzed some of the factors relating to attrition in Oregon school districts. He elaborated some findings by Whitener (1965) in which it was noted that increased tenure in the system was accompanied by higher rates of survival. Both Charters and Whitener agreed that the teacher's "investment" in the system is a potential cause for this relationship but that it did not seem to take effect until after about five years were spent in a district.

For the present study this can be conceptualized as a *cost of leaving* factor (i.e.,

loss of investment) which increases over time but the data base reported here hasn't existed long enough to show its effect.

Cost to reputation. Persons whose background is education-centered, who are presumably committed to a career in some aspect of the education profession, have reason enough to maintain a good employment record. Premature attrition, especially for males, runs counter to such a record. Thus, persons whose future is to be in the teaching profession are assumed to have motivation to persevere for a "respectable" length of service.

For persons not primarily committed to the education profession, premature attrition represents a relatively smaller *cost of leaving.* In fact, rather than stigmatizing the individual, a length of service even as short as one year can be an impressive bit of experience when applying for positions outside of the education profession.

IMPLICATIONS FOR THE QUALITY OF TEACHING IN ALASKA'S REMOTE AREAS

The factors discussed above are best conceptualized as a system of interrelated biases which theoretically would operate either to raise or lower the quality of teaching in the bush.

There is a positive bias operating, somewhat by default, in which persons with a low potential for adjustment are cleared out of the system. This is positive, however, only insofar as adequate adjustment is correlated with teaching competence. We can assume some degree of positive relationship due to the fact that a person having adjustment problems temporarily lacks the freedom to realize his full competence potential.

More seriously, however, is what would be a negative bias in which persons having the greatest competence are drained from the system due to their migration to quality alternatives.

Both of these factors can be predicted to produce an even stronger negative bias. This bias stems from the less than perfect correlation between *adjustment potential* and *level of competence.* To the extent that these factors are uncorrelated, the conditions are created in which there are (a) persons with low competence *and* high adjustment potential who remain in the system an inordinately long period of time, and (b) persons with high competence *and* low adjustment potential who predictably would depart after an inordinately short length of service. Either case can be devastating to the committment of the State of Alaska to provide a high quality of education for its indigenous peoples.

Finally, the role of the *cost of leaving* has positive as well as negative features. Because the relocation costs are less easily absorbed in the first year it is assumed that this would have a slightly perturbing effect on premature attrition. However, some of the benefits of this effect may be lost since, presumably, the same thing would apply to teachers over the entire range of competence. *Investment in the system* is presumed to be negligible in the first three years, but beyond that could be as detrimental as it is beneficial insofar as it is theoretically possible to have teachers of relatively low competence show great durability within the system. The cost of attrition to the teacher's *reputation* also has positive and negative implications since it operates differently on education-centered and non-education centered persons. For the

former, the bias is in the positive direction. However, it is quite reasonable to think that the latter type of individual could be of great value in a setting such as the present one; a setting which cries out for innovation and new ideas. To lose such persons through attrition may result in a profound loss to the prospects of newness and freshness in meeting the education needs of Alaska's rural populace.

CHAPTER 4

SUMMARY AND RECOMMENDATIONS

In this chapter selected research findings are presented which have some implications for future action to reduce the annual loss of teachers to Alaska's rural schools.

Findings

The relationship between a teacher's education background and his length of service may be summarized as follows:

1. Teachers with relatively few college credits are more prone to attrition than teachers with relatively more college credits.

2. Attrition-proneness is greatest in teachers who are hired with little or no formal training in education (especially elementary education).

Three major reasons may be put forth to account for these trends. First, for persons recruited from outside the field of professional education, the classroom becomes an additional adjustment obstacle to the ones already implicit in the extreme environment of rural Alaska. The less previous preparation one has, either in academic or actual teaching experience, the greater this obstacle becomes. Second, the nature of provisional certification requires persons taking formal professional courses to fill their training gaps with summer credits in order to qualify for certification to continue teaching another year. While this demand is legitimate and reasonable, it also may push those who wish not to take the time and expense of summer coursework into a decision to "find something else." Even the most well intentioned bush teacher may find it easy to chalk-up his year to experience and go on to other regions, given this sort of contingency. Third, teachers with few college credits are, by definition, more likely to want to continue their college career as an alternative to continued service in the bush. This is by no means a powerful force in the overall attrition picture but it is an influence worth countering if possible.

Another set of findings has to do with the relationships between various dimensions of teacher quality[1], and subsequent length of service of rural teachers. Two statements summarize these findings:

1. On positive characteristics (eg. predicted success as teachers in the bush), teachers staying for two years of service were generally estimated to be of the highest relative quality. There were no consistent differences between teachers leaving at the end of their first year and those staying three years or longer.

2. On negative characteristics (eg. predicted to have problems in village relations), there was a simple negative relationship with length of service. That is, the fewer nominations received, on negative characteristics, the longer a teacher stayed on the job.

A strong implication is that survival, at least beyond two years of service, is determined more by the absence of negative qualities than by the presence of positive qualities. Premature attrition[2] seems to be related to the reverse; presence of negative and absence of positive qualities, at least those qualities subject to the observation and judgment of peers. More important, however, is the apparent skimming off of the highest quality teachers, after their second year of service. To the extent this

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[1] Estimated from sociometric choices of all teachers participating in the 1966 ARSP summer institute.

[2] Attrition during or immediately following the first year of service is considered premature.

represents a general phenomenon (beyond what has been observed in the present sample), it also represents a serious challenge to create programs designed to obviate the forces attracting such teachers away from the bush.

Perhaps the most far-reaching result described in this study is that ARSP participants show significantly less premature attrition than do their nonparticipating cohorts. The limitations on the generality of this result were discussed earlier and won't be reviewed here, but the major implication remains, that preservice training such as is encountered in ARSP can likely reduce premature attrition by as much as thirteen percent. Such training, if universal could become a major factor in stemming the currently high loss rate of new teachers for Alaska's rural area.

Recommendations

The unique features of teaching in Alaska center upon the notion that, for most new teachers, it is an extreme environment. The extremity takes not only physical forms but cultural, social, and linguistic forms as well. It has been the underlying theme of this report that such features exert unusual demands on the willingness of teachers to hold forth their effort for an extended period of service. The recommendations put forward here may be thought of generally as proposals to neutralize some of these forms of environmental extremity to help reduce the yearly toll taken of potentially effective teachers.

These recommendations are organized under three headings corresponding to three different interaction levels between personnel and the agency of hire – *selection, preparation,* and *retention.*

Selection. It would seem a natural recommendation to select teachers who already meet the traditional requirements of professional educators, and minimize the number of persons on provisional contracts. This will become more feasible as Alaska continues its "embarrassment of riches" in its new found national prominence. Applications for teaching jobs are already on the increase[1] putting state agencies in the singular position of being able to pick and choose more widely than ever before.

A note of caution is in order, however. It may be well worth exploring the continued interjection into the system of persons from outside the ranks of academically trained educators. This is suggested as a force for *continued* change and innovation already going on in our rural school systems. An observation which readily comes to mind is that such persons historically show less chance of survival in the bush. Why continue to recruit them? An approach to meeting this objection is outlined in the final section *(Retention)* of this chapter.

Preparation. It is clear now that preservice preparation would be beneficial for all new teachers going into remote areas. At present, little more than 20 percent of our new teachers are given such training. It is recommended that earnest consideration be given to the expansion of such programs as the Alaska Rural School Project so that this kind of experience becomes universal.

Retention. Once they are hired and have begun teaching in a rural area, additional influences must certainly come into play to tax the adaptive skills of new teachers. Even for the teacher with academic training in elementary education, the newness of the cultural setting, the remoteness of the village, and the smallness of the school can represent such influences. These problems must then be compounded for teachers without training in elementary education.

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[1] Personal communication, June, 1970, from Merle Armstrong, Director of State Operated Schools in Alaska.

The program proposed here is designed to provide experiences to help teachers maintain an ongoing interaction with the academic community while simultaneously employed in a rural school setting. As such, the overall objective of this program is to motivate the teacher to extend his service to his community by increasing his ability to meet the special demands of the Alaskan rural teaching environment. Implicit in this major objective is the recommendation that field-based academic curricula be established under the control of resource persons directly acquainted with the cross-cultural, educational, and physical problems associated with life in the bush school.

This major objective may be further broken down into component objectives relevant to the needs of three general groups of teachers:

1. **New teachers with no previous academic training in education** – to provide field-based on-the-job experiences which will meet the requirements for continued provisional certification until full certification requirements are met. These experiences would help increase the motivation of teachers on provisional contracts to pursue full certification by making immediately available a curriculum relevant to his teaching needs.

2. **New teachers with Secondary training only** – to provide experiences relevant to teaching in elementary grades which also would be applicable to certification requirements.

3. **New teachers with full Elementary certification** – to provide field-based experiences relevant to teaching children of other cultures in small school settings. Of major relevance would be courses designed to increase the teacher's aiblity to identify and deal with language barriers encountered by children from a linguistic community different from his own.

A preliminary outline of the process by which such a program could be implemented might include the following features:

1. A comprehensive nationwide review of existing correspondence courses potentially relevant to the professional sequence in elementary education.

2. An assessment of the availability of resources for the adaptation of these and other courses to a field-based curriculum. Examples of such resources would be (a) experienced bush teachers, (b) local university faculty, and (c) statewide audio-visual facilities.

3. The development of channels for (a) remote monitoring of performance, and (b) direct feedback of results to teachers in the bush program.

4. The vesting of overall control of the program under the joint coordination of the Alaska Department of Education and the University of Alaska. A precedent for this kind of control is presently under observation in the Teacher Corps/Career Opportunities Program, in the state of Alaska.

This program is recommended under the overriding assumption that many teachers are lost to the system because they feel they are not effective. What better remedy than to perceive a day-to-day increase in one's own level of teaching competence.

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APPENDIX A

DESCRIPTIONS OF INSTRUMENTS EMPLOYED IN THE PRESENT INVESTIGATION

Miller Analogies Test

The *Miller Analogies Test* (MAT) comprises 100 rather difficult verbal analogies of this type – "Pride is to school, as lion is to _____." The subject indicates which of a number of alternatives e.g., (a) combat, (b) king, (c) instruction, or (d) minnow, is the correct or most applicable one. The MAT is most closely related to tests of general verbal ability and has shown some efficiency in predicting such varied achievements as success in graduate school and high levels of executive performance.

Minnesota Teacher Attitude Inventory

The *Minnesota Teacher Attitude Inventory* (MTAI) is a self-report instrument designed to elicit attitudes on teacher-pupil relations. The teacher's score on this test relfects the extent to which his responses match those of "good" or "poor" teachers, as defined by ratings of principals, students, and outside (expert) observers. No attempt has been made, either empiracally or rationally, to create subscales of the 150 MTAI items that differentiate subsystems of attitudes toward teacher-pupil relations.

Biographical Information Inventory

In its present form, the *Biographical Information Inventory*, developed especially for ARSP, consists of 24 items related to the teacher's background in areas such as his early childhood environment, socioeconomic status, and patterns of leisure time pursuits. Table 2, presents the items and their response alternatives. Table 3, is the matrix of factor loadings of each item on each of the eight obtained factors. (See Appendix B for a discussion of the factoring procedure.)

TABLE 2

Items of the Biographical Information Inventory

Item No.

1. What is (was) your father's education?
   1. 0-8
   2. 9-11
   3. 12, high school graduate
   4. 1-3 years college
   5. College graduate, graduate work

2. What is (was) your father's vocation?
   1. Unskilled laborer
   2. Semi-skilled laborer
   3. Clerk or other white collar
   4. Professional (include proprieter, manager, as well as counselors, doctor, etc.)

TABLE 2 (Continued)

3. What is (was) your mother's education?
   1. 0-8
   2. 9-11
   3. 12, high school graduate
   4. 1-3 years college
   5. College graduate, graduate work

4. What is (was) your mother's vocation?
   1. Non-professional
   2. Semi-professional
   3. Housewife
   4. Professional

5. How would you describe your childhood?
   1. Extremely happy
   2. Happy
   3. Rather happy
   4. Rather unhappy
   5. Unhappy

6. Altogether, how long did you live away from home up to age 17?
   1. month or less
   2. 1 to 6 months
   3. 6 months to one year
   4. 1 to four years
   5. more than 4 years

7. Which of the following best describes the amount of traveling you did up to age 21?
   1. A great deal including foreign countries
   2. Considerable, but not foreign countries
   3. Considerable, but within my own locale
   4. Some traveling
   5. Little if any traveling

8. With whom or where did you live most of the time up to age 16?
   1. Other than both parents
   2. Both parents

9. To what extent did you feel close to your family; i.e., how much were you an integral part of the family group?
   1. To a very great extent
   2. To a large extent
   3. To some extent
   4. To a small extent
   5. To a very small extent

10. How would you describe the marital happiness of your parents while you were growing up?
    1. Very happy
    2. Happy
    3. Moderately happy
    4. Rather happy
    5. Unhappy

TABLE 2 (Continued)

11. Up to the age of 18 how would you describe your home life and your relationship with your parents?
    1. Practically perfect
    2. Satisfactory
    3. Rather satisfactory
    4. Rather unsatisfactory
    5. Unsatisfactory

12. Your grade school was:
    1. Metropolitan
    2. Urban
    3. Suburban
    4. Rural

13. The high school you attended was:
    1. Metropolitan
    2. Urban
    3. Suburban
    4. Rural

14. Enrollment in the grade school you attended was:
    1. 1-50
    2. 50-100
    3. 100-300
    4. 300-500
    5. 500-

15. To what extent do you prefer working alone (as compared to working with a supervisor)?
    1. A very great deal
    2. A great deal
    3. Some extent
    4. A small extent
    5. A very small extent

16. How often do you have a desire to be alone, to pursue your own thoughts and interests?
    1. Very frequently
    2. Frequently
    3. Occasionally
    4. Rarely
    5. Very rarely

17. To what extent do you enjoy conversation with ordinary conventional people?
    1. Tends to annoy me because of its superficiality
    2. Rarely interesting
    3. Occasionally interesting
    4. Usually interesting

TABLE 2 (Continued)

18. To what extent have you found books interesting?
    1. Frequently
    2. Occasionally
    3. Rarely
    4. Very rarely, if ever

19. How often do you generally watch television at home?
    1. A few hours every day
    2. Approximately one or two shows almost every day
    3. A few shows per week
    4. A few shows per month or less
    5. Don't watch television

20. Indicate the extent to which you have participated in watching sports events.
    1. Very frequently
    2. Frequently
    3. Occasionally
    4. Seldom
    5. Never

21. Indicate the extent to which you have participated in general "bull sessions."
    1. Very frequently
    2. Frequently
    3. Occasionally
    4. Seldom
    5. Never

22. Indicate the extent to which you have participated in social club activities.
    1. Very frequently
    2. Frequently
    3. Occasionally
    4. Seldom
    5. Never

23. How many teacher's journals do you review regularly?
    1. 6 or more
    2. 4 or 5
    3. 3 or 4
    4. 1 or 2
    5. None

24. Do you like to mix with other people?
    1. To a great extent
    2. To some extent
    3. To a small extent
    4. If it cannot be avoided
    5. Not at all

TABLE 3

Matrix of Rotated Factor Loadings of All Items on All Factors

Item	I	II	III	IV	V	VI	VII	VIII	(h^2) [a]
1	.01	.84	−.02	.04	−.06	.02	−.00	.14	.73
2	.17	.73	.16	−.12	−.12	.05	.30	.07	.71
3	.10	.73	.08	.08	−.24	.10	−.19	−.11	.68
4	.15	.36	−.04	.15	.03	.11	−.22	−.65	.66
5	−.80	−.17	.09	.14	−.02	−.08	.16	.04	.73
6	−.34	.03	.06	.42	.01	−.37	.14	−.06	.47
7	−.05	.58	−.07	−.04	−.13	−.07	.34	−.16	.51
8	.40	.09	−.03	−.10	.14	.53	.34	−.02	.60
9	−.80	.17	.07	.03	−.17	−.01	−.14	.13	.74
10	−.74	−.21	−.00	.12	−.01	−.20	−.01	−.04	.65
11	−.86	−.00	.01	−.04	.03	.11	.01	.05	.75
12	.02	−.15	−.09	.03	.86	−.03	.06	.06	.77
13	−.03	−.13	−.05	.10	.79	−.06	−.05	.16	.68
14	−.14	.12	−.08	.06	−.68	−.03	.04	.18	.54
15	−.00	−.23	−.74	−.12	−.14	.05	−.07	.15	.67
16	−.04	−.07	−.69	.08	.06	−.05	.08	−.25	.56
17	.13	.15	−.65	−.09	.19	.06	−.08	−.11	.52
18	.05	−.14	−.03	−.01	−.01	−.02	−.74	.02	.57
19	−.09	.06	.00	.17	−.15	.76	.01	−.07	.64
20	.11	−.23	−.08	.66	−.19	.16	.39	−.06	.73
21	−.11	.05	.05	.64	.11	−.01	−.24	−.11	.51
22	−.11	.06	.10	.67	.05	.11	.01	.26	.56
23	−.03	.21	.13	.17	.07	−.05	−.20	.70	.63
24	−.25	−.06	.55	.04	.15	.50	−.18	−.15	.70

[a]The value (h^2) refers to the item's communality. It is the sum of the item's squared factor loadings across all factors and is interpreted as the proportion of the item's variance attributable to the eight factors.

APPENDIX B

TECHNICAL NOTES

PERSONAL CHARACTERISTICS AND THE ATTRITION OF COUPLES

MAT and MTAI Scores

The analysis of MAT and MTAI scores begin with the inspection of the scores of couples, divided into two discrete criterion groups – couples still teaching in the bush and couples not still teaching in the bush. It was immediately clear that a simple comparison of means of attrited and surviving persons would not explain the data adequately. The data therefore were reorganized to reflect the relationship between husband and wife by simply subtracting the wife's score from her husband's score. The resulting difference-scores were initially analyzed by a t-test for independent means. Table 4, summarizes the results of the t-tests for the MAT and MTAI difference scores.

TABLE 4

Summary of t-tests for MAT and MTAI Difference Scores

	Mean Difference Score (H-W)			
Variable	Attrited Couples	Non-Attrited Couples	t (of Diff.)	p
MAT	18.5	2.4	2.02	.10
MTAI	7.7	–23.4	1.76	.20

An additional analysis was made to determine the extent to which the directionality of the difference-scores is associated with attrition. The difference-scores for each test were arranged into two-by-two contingency tables, based on the sign (plus or minus) of the couple's difference score and the couple's criterion category (attrited or not attrited). Each table was subjected to Fisher's exact probability test (Siegel, 1956, p. 96). Table 5, summarizes the results of this analysis. The conclusions concerning the complementarity and homogeniety of the intracouple patterns were based in large part on this analysis. The significant directionality seen on the MTAI suggested the dual complementarity discussed in the text of the report. The lack of significant directionality especially for surviving couples, on the MAT led to the conclusion that complementarity held for attrited couples only.

TABLE 5

Fisher's Exact Probability Tests on Direction of MAT and MTAI Difference Scores

	Direction of Difference Score (H-W)					
Status	MAT			MTAI		
	plus	minus	Total	plus	minus	Total
IN	5	4	9	1	8	9
OUT	5	1	6	4	2	6
Probability	Not Sign.			.05		

Education Background

In their raw form, the educational background data utilized in this report do not meet the assumption of being drawn from continuous and normal underlying distributions of values. Scores reflecting credit hours, completed in the various phases of the college career, tend to cluster around more than one mode, due mainly to the necessities of college program organization. Parametric statistical tests generally require data to be relatively free of such peculiarities while non-parametric tests generally do not.

Three education variables were chosen for analysis:

1. the total number of credit hours each husband had acquired,
2. his total hours in education courses (other than in elementary education), and
3. the number of hours he completed in elementary education courses. The non-parametric Mann-Whitney U-test (Siegel, 1956, p. 116) was employed to estimate the extent to which each of the three variables differentiates attrited and non-attrited couples. This test gives the probability that the two criterion groups are evenly distributed throughout a set of ranks. (The ranks are based on the credit hours acquired under each of the above education variables.) The lower the probability on a given variable, the more confidence may be vested in the hypothesis that one group exceeds the other in credit hours. The probability is obtained by simply counting the number of times each member of one group is preceeded in the ranking by a member of the other group. For example, in the following set of ranks:

Rank	1	2	3	4	5	6	7	8	9	10	11	12	U
Group	A	A	A	B	A	B	A	A	B	B	B	B	
Sum (U)					1		+2	+2					5

Members of group B preceed members of group A a total of U=1+2+2=5 times. This has a probability of chance occurrence of p=.021. This probability is small enough to allow us to decide that A's tend to be higher in the order of ranks than B's, and that this tendency is due not merely to chance.

For the present study there are six attrited (O) couples and nine non-attrited (I) couples. Table 6, shows the arrangement of these couples in their rank order for each of the three education variables.

TABLE 6

Rank Distribution of Husbands in Attrited (O) and Non-Attritted (I) Couples on Three Education Variables

	RANK																
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**U**	**p[a]**
Total Credits	I	I	O	O	I	I	I	I	I	I	O	I	O	O	O		
Sum for U					2	+2	+2	+2	+2	+2		+3				15	Not Sign.
Hrs. in Ed.	I	O	O	I	I	I	I	I	I	O	I	O	O	O	I		
Sum for U				2	+2	+2	+2	+2	+2		+3				+6	21	Not Sign.
Hrs. in Elem. Ed.	I	I	I	I	I	O	O	I	I	O	O	I	O	I	O[b]		
Sum for U								+2	+2			+4		+5		13	Not Sign.

[a]For alpha = .05, and a one-sided test of significance.

[b]Ten subjects were tied at zero credit hours; four in group (I) and six in group (O). For the calculation of U they were assigned to ranks 6 through 15 at random. The possible values of U range from 0 to 24, for this variable.

As discussed in the text of report, none of the three variables, taken singly, is able to distinguish reliably between couples who survived (I) and couples who attrited (O). There is, however, a strong tendency for the three variables, when combined in a single composite, to make the relevant distinction in a most adequate fashion. The method for combining the variables into a composite first requires each to be normalized, i.e., transformed to a distribution with a mean of $\overline{X}=0$, and a standard of deviation of SD=1. This has the essential effect of giving each of the three variables equal weight in the formation of the composite.[1] Table 7, shows the cumulative effect of including successively the three variables in order, from one to three.

TABLE 7

Rank Distribution of Successive Composites of Variables Associated with Husbands' Education Background

	RANK																
Composite	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	U	p
1	I	I	O	O	I	I	I	I	I	I	O	I	O	O	O		
Sum for U					2	+2	+2	+2	+2	+2		+3				15	Not Sign.
1+2	I	I	O	I	I	I	I	I	O	O	I	I	O	O	O		
Sum for U				1	+1	+1	+1	+1			+3	+3				11	.05
1+2+3	I	I	I	I	I	O	I	I	I	O	O	I	O	O	O		
Sum for U							1	+1	+1			+3				6	.01

This cummulative effect supports the notion implied in the theoretical section that attrition decisions are determined by a set of multiple factors, not a single event. The domain of education variables appears to represent a set of conditions, combinations of which may be *necessary* for a decision to attrite but no one of which can be considered sufficient for that end.

Biographical Information

The first step in the analysis of the data obtained from the *Biographical Information Inventory* was to group items into a more manageable number of factors. This was accomplished by the method of *factor analysis.* This method estimates the extent to which each item correlates with each of a set of reference dimensions, the number of which is less than the number of original items. The factor analysis program of the IBM Scientific Subroutine Package (1968) was utilized for this purpose. There were 24 variables based on the responses of 134 subjects entered into this analysis. (These variables are listed in Appendix A.) In the first phase *(principal axes* solution) it was determined that eight reference dimensions (factors) would account for the 24 original variables. In the second phase (*Varimax* rotation) the best estimate was made of the correlation (loading) of each original variable on each reference dimension. Variables that have a high correlation with a given dimension i.e., that form a factor, are assumed to be somewhat redundant measures of the same response domain. The advantages of this procedure are twofold. First, the amount of manipulated

[1] Even though variable one includes variables two and three, it stands alone by virtue of its theoretical importance as a separate predictor of attrition. Mathematically, variables two and three are weighed slightly more than variable one.

information is reduced to a more manageable size. Second, the obtained factor scores (described below) are more stable and reliable than scores of any one of the factor's single items.

Appendix A, page 21, lists the correlations (factor loadings) of each item on each factor.

The second step was to rescore the subjects' original responses on each of the eight biographical factors. This was done by weighting each response by the loading the item has on the factor and summing the weighted response across items. By this method, items that contribute a great deal to a dimension get the greatest weight in scoring a subject's responses for that dimension. The result of this step is to give each subject scores on eight biographical variables (dimensions), comprising clusters of the original 24 *Biographical Information Inventory* items.

The third step of the analysis was to determine the extent to which the biographical factors are able to differentiate attrited and non-attrited couples. Table 8, shows the mean factor scores of husbands and wives in attrited and non-attrited

TABLE 8

Mean Factor Scores of Attrited (O) and Non-Attrited (I) Husbands and Wives on Eight Biographical Factors

	FACTOR							
Group	I	II	III	IV	V	VI	VII	VIII
Attrited[1]								
Husband	−6.7	11.0	−3.4	8.8	2.5	5.2	0.7	2.4
Wife	−5.9	9.4	−4.2	8.9	1.6	5.4	0.1	1.7
Difference (H-W)	−0.8	1.6	0.8	−0.1	0.9	−0.2	0.6	0.7
Non-Attrited[2]								
Husband	−7.9	11.4	−3.1	9.4	−0.1	5.5	0.8	0.9
Wife	−5.5	12.0	−4.5	9.8	0.8	5.6	0.4	0.7
Difference (H-W)	−2.4	− 0.6	1.4	−0.4	−0.9	−0.1	0.4	0.2

[1] N = 6; [2] N = 9

couples on eight biographical factors. While inspection of this table suggests a number of factors may show promise in differentiating the two criterion groups, only two held up under rigorous scrutiny. These were factors V and VIII (see Appendix A, Table 3).

To analyze the relationship of the factors to attrition the method of *analysis of variance*[1] was utilized. A factorial design was chosen with husband-wife and attrition-survival comprising the main effects. There was a special problem associated with the organization of the data for analysis. Husband-wife differences, due to within-couple variation, had to be disassociated with the overall estimate of error variance. To do this the data were treated as if there were repeated measures on one factor (the *spouse* factor). Winer (1962, p. 302) presents a computational model appropriate to this task. This design assesses the following components:

[1] A more general discussion of *analysis of variance* follows in the next section.

(a) **Male-female differences** – which are not of primary interest by themselves
(b) **Attrited – non-attrited differences** – which are of major interest, and
(c) **Interactions** between (a) and (b) – which are also of primary interest, but from inspection of factors V and VIII, in Table 8, should not be of significant magnitude.

As stated previously, the only significant effects relevant to the prediction of attrition occurred on factors V and VIII. Analysis of variance summaries for these factors appear in Table 9. As can be seen, there was no significant interaction effect for either factor. Only the attrition-survival main effects were significant, the conclusions from which are discussed in the text of this report.

TABLE 9

Analysis of Variance Summaries for Two Biographical Factors

Source of Variation	Sum of Squares	df.	Mean Sq.	F-ratio	Probability
Factor V: Rural-Urban Background					
Between Couples:	**82.65**	**14**			
Criterion	20.20	1	20.20	4.21	.10
Couples within groups (error)	62.45	13	4.80		
Within Couples:	**41.94**	**12**			
Male-Female Differences	.06	1	.06	- - -	
Criterion x Spouse	5.44	1	5.44	1.49	Not Sign.
M-F x Couples within groups (error)	36.44	10	3.64		
Factor VIII: Teachers Journals – Mother's Occupation Level					
Between Couples:	**28.51**	**14**			
Criterion	12.17	1	12.17	9.66	.01
Couples within groups (error)	16.34	13	1.26		
Within Couples:	**13.98**	**12**			
Male-Female Differences	2.19	1	2.19	1.89	Not Sign.
Criterion x Spouse	.19	1	.19		
M-F x Couples within groups (error)	11.60	10	1.16		

As a final note, the interpretation and naming of factors is always subject to some degree of speculation. One begins with the conditions set by the empirical fact that a set of items do, indeed, form a cluster. This sometimes forces the onus of explanation into a very speculative stance. Such is the case with factor VIII. As discussed in the text, the label given this factor is tentative and perhaps forced. All we know is (a) the items comprising it are highly intercorrelated and (b) the factor differentiates attriters from non-attriters. (The possibility of chance differences occurring cannot be ruled out completely but the probability of this event is less than one in a hundred.) Part of the

label's rationale is that the high relationship between the number of education journals reviewed regularly and the mother's occupation is probably due to the number of mothers whose profession is teaching. This would make more likely the possibility of exposure to teacher's journals. This is speculation, of course, but tends to add force to the contention that being "centered" in the education profession is related to the ability to survive in the bush teaching environment.

TEACHER QUALITY AND LENGTH OF SERVICE

A factorial analysis of variance design was chosen as the most relevant model for the treatment of the sociometric data discussed in Chapter 2. Two factors (main effects) assume importance in this model:

(1) **Length of Service** (LOS) – Three *levels* were identified, corresponding to the number of school years (one, two, or three) a subject taught in the bush, subsequent to his participation in the 1966 ARSP Summer Institute, and

(2) **Agency** (A) – Two *levels* were identified corresponding to whether the subject was hired originally by the State Operated School system, or the Bureau of Indian Affairs.

Under this arrangement, each subject was simultaneously classified under his appropriate *level* for both factors. This gives rise to 2x3=6 available classifications.

With this model there are four sources of variation operating on the dependent variable (number of nominations granted on a given sociometric item):

(1) Variation associated with *length of service*,

(2) variation associated with *agency* of hire,

(3) variation associated with the interaction between (1) and (2), i.e., effects which transcend either main effect taken alone, and

(4) variation associated with the dispersion of scores about the mean of each of the six classification groups.

The latter source of variation, sometimes referred to as variance due to experimental *error*, assumes the role of a standard against which the other sources are compared to assess the significance of their contribution to variation in the dependent variable. This comparison is accomplished by taking a ratio (known as an F-ratio) of the variance of each separate source to the error variance. If an F-ratio exceeds a size reasonably attributable to chance occurrence, that source of variance is said to be related significantly to the dependent variable.

Before proceeding there are two special problems inherent in the present data which warrant elaboration. First, there was a tendency for peer nominations to give positively skewed distributions of values. A related condition was for the means and variances of the classified groups to be somewhat correlated. Both of these conditions strain the assumptions underlying the *analysis of variance* model presently utilized. An appropriate data transformation was required, therefore, which would produce a more adequate fit. This transformation was accomplished by the formula

$$X' = \sqrt{X + .5} \qquad (1)$$

suggested by Edwards (1963, p. 128). A new score (X') is arrived at by adding .5 to the subjects' original score (X) and taking the square root of the sum. This procedure, by having a more perturbing influence on high scores than on low scores, has the dual effect of (a) reducing positive skewness, and (b) stabilizing subgroup variances so as to be less correlated with subgroup means. Both effects create distributions more in keeping with the assumptions of the *analysis of variance* model.

Special precautions were taken in cases where significant distortion remained in effect. Distortion in this case refers to the condition called *heterogeniety of variance.* The probabilities associated with F-ratios assume that variances within treatment classifications are homogeneous across all treatment groups. F-ratios based on heterogeneous within-treatment variances have a slightly positive bias. Therefore, decisions to reject the null hypothesis will occur more often than is warranted (Winer 1962, p. 92). While this bias is generally quite negligible, steps sometimes can be taken, as in the present data, to neutralize its presence. In cases where significant heterogeniety of variance was shown to exist (by Cochran's C-test, in Winer 1962, p. 94), the error estimate employed in the F-ratio was based on the maximum variance obtained in any one of the subclassifications (treatments). In neither of the two relevant cases (variables 3 and 5) did this procedure lead to a different probability estimate, however, so that the probabilities reported here are for the original F-ratio.

The second problem in this data showed up on variables (4) and (8). A slight confounding between within-treatment group variances and the *Agency* main effect led to a condition where the experimental treatments accounted for slightly less of the total variance prior to portioning into the various effects than after. This condition, however, is so slight as to have no effect on the conclusions drawn from the more obvious trends in the data.

Table 10, summarizes the analyses of variance for each of the eight peer-nomination variables discussed in the text. These summaries, interpreted with reference to their graphic portrayals given in Figure 3, page 10, clearly show a nonlinear relationship between *Length of Service* over a three-year period, and quality estimates on positive attributes (figs. 1-5). This relationship is generally referred to as an inverted U-shaped function. On negative attributes the relationship is clearly inverse and monotonic; the classic negative correlation.

An additional analysis was made in which the significance of the nonlinear component was assessed for the combined positive items (1-5) and the combined negative items (6-7). The purpose was to point out the extremely different types of relationships that hold for positive attributes and negative attributes when attempting to predict how long a teacher will survive.

The procedure is described by Guildord (1950, p. 314-320). Briefly, the proportion of criterion (LOS) variance attributable to its linear relationship with the independent variables (combined peer nominations) is compared with the proportion of criterion variance attributable to its nonlinear relationship with the independent variable. Estimates of these proportions are given by squaring the Pearson product

TABLE 10

Analysis of Variance Summaries for Eight Peer-Nomination Variables

1. " . . . most intelligent participants."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	**24.05**	**5**	**4.81**	**6.31**	**.01**
Length of Service	17.74	2	8.87	11.63	.01
Agency (SOS-BIA)	1.75	1	1.75	2.30	Not Sign.
LOS x Agency	4.56	2	2.28	2.99	Not Sign.
Within (error)	28.21	37	0.76		

TABLE 10 (Continued)

2. " . . . predict success in teaching in Alaskan rural schools."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	**18.58**	**5**	**3.72**	**7.17**	**.01**
Length of Service	13.71	2	6.85	13.23	.01
Agency (SOS-BIA)	0.69	1	0.69	1.33	Not Sign.
LOS x Agency	4.18	2	2.09	4.04	.05
Within (error)	19.17	37	.52		

3. "If you were a principal (choose) five teachers from the Institute."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	**19.43**	**5**	**3.87**	**6.71**	**.01**
Length of Service	16.48	2	8.24	14.23	.01
Agency (SOS-BIA)	0.66	1	0.66	1.14	Not Sign.
LOS x Agency	2.29	2	1.14	1.98	Not Sign.
Within (error)	21.43	37	0.58		

4. " . . . participants whose advice you would seek on teaching."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	**24.12**	**5**	**4.82**	**5.54**	**.01**
Length of Service	22.83	2	11.42	13.11	.01
Agency (SOS-BIA)	1.89	1	1.89	2.17	Not Sign.
LOS x Agency	0.00	2	0.00	- - -	Not Sign.
Within (error)	32.23	37	0.87		

5. " . . . participants . . . you would choose academically."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	**22.49**	**5**	**4.50**	**7.43**	**.01**
Length of Service	21.24	2	10.62	17.53	.01
Agency (SOS-BIA)	0.01	1	0.01	- - -	Not Sign.
LOS x Agency	1.25	2	0.62	1.03	Not Sign.
Within (error)	22.41	37	0.61		

6. " . . . anticipate teaching problems in Alaska rural schools."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	**11.16**	**5**	**2.23**	**2.73**	**.05**
Length of Service	8.71	2	4.35	5.32	.01
Agency (SOS-BIA)	0.04	1	0.04	- - -	Not Sign.
LOS x Agency	2.41	2	1.21	1.48	Not Sign.
Within (error)	30.26	37	0.82		

TABLE 10 (Continued)

7. " . . . anticipate problems in village relations."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	6.73	5	1.35	2.22	Not Sign.
Length of Service	6.24	2	3.12	5.15	.025
Agency (SOS-BIA)	0.50	1	0.50	- - -	Not Sign.
LOS x Agency	0.00	2	0.00	- - -	Not Sign.
Within (error)	22.43	37	0.61		

8. " . . . participant . . . you would choose socially."

Source of Variation	Sum of Squares	df	Mean Square	F-ratio	Probability
All Treatments	2.70	5	0.54	- - -	Not Sign.
Length of Service	1.43	2	0.72	1.14	Not Sign.
Agency (SOS-BIA)	0.29	1	0.29	- - -	Not Sign.
LOS x Agency	0..98	2	0.49	- - -	Not Sign.
Within (error)	23.43	37	0.63		

moment r between LOS and the independent variable and the correlation-ratio (η) for the same data, respectively. The Pearson r is affected only by linear correlation while (η) is sensitive to both linear and nonlinear correlation. The relevant test for nonlinearity is given by

$$\chi^2=(N-k)\ [\eta^2-r^2)\ /\ (1-\eta^2)] \qquad (2)$$

where N is the number of subjects (43) and k is the number of criterion (LOS) classifications (three). The values given by formula (2) comprises a χ^2 distribution for k−2 degrees of freedom.

Scores on all positive items (one through five) were summed to create a composite estimate of each S's overall position on positive attributes. The same was done for the two negative items (six and seven). These scores were then correlated with the LOS criterion by (1) the Pearson (r) procedure and (b) the correlation ratio (η) procedure. Table 11, shows the results of the two correlation procedures and the χ^2 for nonlinearity of each composite obtained from formula (2).

The positive items do, indeed, show a significant curvilinear relationship with

TABLE 11

Pearson r's and Correlation Ratios Between Peer Nominations and LOS Criterion for Positive and Negative Composites

	Correlations			
Variables	Pearson (r)	Eta (η)	χ^2 (for diff.)	p
Positive items and LOS	.12	.74	47.6	.01
Negative items and LOS	−.47	.49[a]	1.0	Not Sign.

[a]Correlation ratio (η) does not carry a sign, it only indicates the degree of relationship. This particular value may be regarded as negative.

length of service while the negative items show no significant curvilinearity. This supports the theoretical contention that positive and negative attributes bear markedly different relationships to the attrition of teachers in an extreme environment.

THE ALASKA RURAL SCHOOL PROJECT AND ATTRITION

The criteria for classifying for attrition, the ARSP and non-ARSP particpants, was described in the text of the report and won't be elaborated here.

The χ^2 test of significance was applied to the data arranged into two-by-two contingency tables, each with df=1 degree of freedom (i.e., only one cell of the matrix can vary since the rest are fixed by subtraction from the marginal values). Yate's correction for discontinuity between cells was employed as described in Edwards (1963). Since the expected direction the data would take was specified *a priori*, a *one-sided* test of significance was deemed appropriate.

For the data in Table 1, page 11, the χ^2 value was 2.76. This is significant at the .05 level of confidence.